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**Arizona Five-Spined Ips**

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The Arizona five-spined ips (*Ips lecontei* Swaine) is the most destructive pine bark beetle in central and southern Arizona. Although it ranges from northern Arizona and southern New Mexico south into Honduras (fig. 1), damage in the United States is limited almost exclusively to central and southern Arizona. Damage may become more widespread in the Southwestern United States as timber management is practiced on second growth and the thinning of ponderosa pine stands is increased.

Several thousand trees of sapling to pole size are killed each summer by this insect. The trees are killed in groups of up to 125 (fig. 2, F). Occasionally, larger single trees growing under poor conditions at homesites and in recreational areas are killed by the beetle. Infestations impair timber management plans, disrupt tree-cutting budgets, and at times, adversely affect areas of high esthetic value.

**Hosts**

In Arizona during April, May, and June, the insect prefers fresh slash and trees injured by natural forces, such as wind or lightning. The beetle prefers ponderosa pine

but has been collected also from *Pinus montezuma* Lamb., *Pinus oocarpa* Schiede, and *Pinus durangensis* Martinez.

**Evidence of Infestation**

Trees infested by the Arizona five-spined ips can be distinguished by their fading foliage. Within a few weeks after infestation, needles in the topmost part of the crown change to a light straw color. The fading progresses until all the foliage of the tree becomes yellow or yellowish brown. Further evidence of attack is the presence of reddish-brown boring dust in the crevices of bark and at the tree base. Mounds of reddish-brown boring dust can be found on the upper surface of slash infested by the insect.

Not all trees with the foregoing symptoms are infested only by *Ips lecontei*. *Ips pini* and *Ips plastrographus* may attack the same trees attacked by the Arizona five-spined ips, especially during the spring, when all three species are found intermixed in fresh slash.

**Description of Stages**

Young adults of the Arizona five-spined ips are light brown but darken to black as they mature (fig. 2, D). They are about  $\frac{3}{16}$  inch long and have five small spines on each side of the declivity at the hind end

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Figure 1.—General distribution of the Arizona five-spined ips.

of the wing covers. Adult females lay small white, oval eggs (fig. 2, *A*). The eggs hatch into grublike, legless larvae (fig. 2, *B*) which, when fully grown, transform into pupae (fig. 2, *C*). The pupae are white and bear many of the adult characters, such as antennae and wing covers.

### Life History and Habits

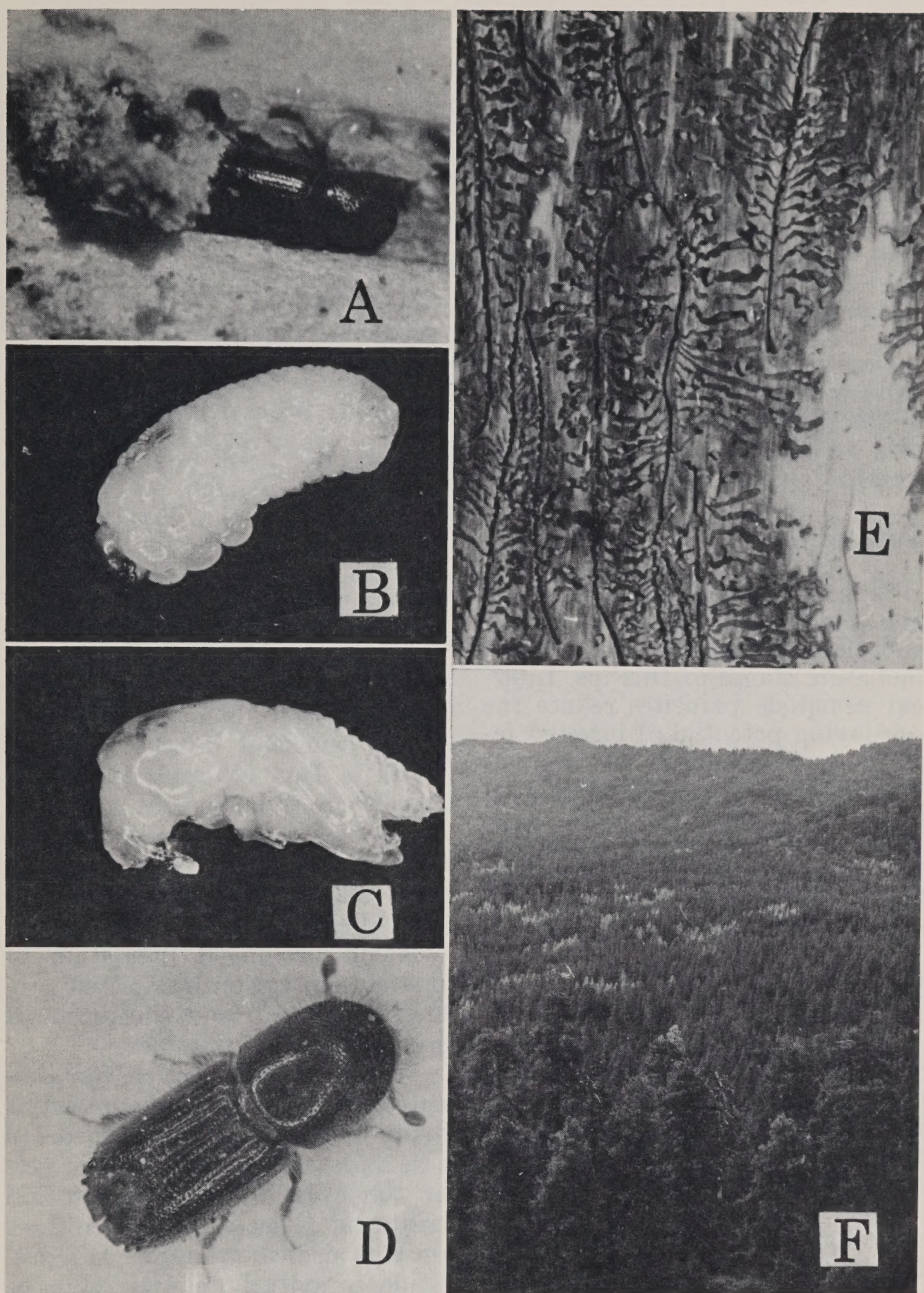
*Ips lecontei* overwinters as a mature adult in standing trees. Large numbers occur either in feeding galleries at the base of trees or in areas of the trees that have escaped attack. In April and early May, the adults emerge and attack fresh slash and injured trees in the nearby area. By the latter part of June, broods produced by the overwintering adults emerge and aggressively at-

tack and kill groups of apparently healthy trees.

Initial attack is usually confined to the upper 10 to 15 feet of the bole. The lower part of the trunk is then gradually attacked over a period of 1 to 2 months. From the time the overwintering adults emerge until the following winter, there are three complete generations; there is continuous flight and attack because of overlap of the generations.

The beetles are polygamous. The male beetle initiates the attack on a tree by boring through the bark and forming a nuptial chamber in the inner bark. He is then joined by one to five females. Each fertilized female then constructs an egg gallery up to 25 inches long. There are an average of three galleries per nuptial chamber (fig. 2, *E*). The eggs are laid in niches on each side of the galleries, which are then plugged





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Figure 2.—Arizona five-spined ips: *A*, female laying eggs; *B*, larva; *C*, pupa; *D*, adult; *E*, egg and larval galleries in inner bark; *F*, groups of trees killed by the beetle.



with frass. The female lays an average of 6.5 eggs per linear inch of gallery. Eggs hatch in approximately 1 week during the summer. The larvae may feed gregariously for a short time; then each forms a separate feeding gallery, initially perpendicular to the egg gallery but then wandering, generally at right angles to it, in the phloem. After larvae develop to maturity—in 2 to 3 weeks—they form pupal chambers between the inner and outer bark and transform to pupae and then to adults. During the summer, from 4 to 5 weeks are necessary for the insect to develop from egg to adult.

### Natural Control

Several hymenopterous insects and predaceous beetles parasitize and feed on both the mature and immature stages of this ips. Internal nematode parasites reduce the egg-laying potential of infested females by as much as 50 percent. Winter temperatures of  $-5^{\circ}$  F. and lower for a period of a few days cause extensive beetle mortality. These factors help to hold low populations of the beetle in check but are not sufficient to control epidemics.

### Cultural Control

Sanitation practices are essential during certain parts of the year to prevent concentrated beetle attack. It is essential to dispose of all logging debris over 3 inches in diameter left during spring and early summer. Such material serves as breeding places for the beetle. Prompt disposal of slash and cull logs produced during the spring is necessary to protect ponderosa pine stands in logging areas from *Ips lecontei* during July. Slash should be piled and burned before the beetles emerge or should be scattered in the open where the sun will dry it, making it unsuitable as a beetle breeding place.

### Applied Control

To prevent broods from emerging from infested trees and attacking nearby green trees, all stages of the insect can be killed by applying solutions of ethylene dibromide to standing or felled trees. To 1 pint of emulsifiable concentrate containing 85-percent ethylene dibromide, add enough No. 2 fuel oil to make 5 gallons of spray. Apply with low-pressure sprayer to point of runoff.

### Pesticide Precautions

Pesticides used improperly can be injurious to man, animals, and plants. Follow the directions and heed all precautions on the labels.

Store pesticides in original containers under lock and key—out of the reach of children and animals—and away from food and feed.

Apply pesticides so that they do not endanger humans, livestock, crops, beneficial insects, fish, and wildlife. Do not apply pesticides when there is danger of drift, when honey bees or other pollinating insects are visiting plants, or when they may contaminate water or leave illegal residues.

Avoid prolonged inhalation of pesticide sprays or dusts; wear protective clothing and equipment if specified on the container.

If your hands become contaminated with a pesticide, do not eat or drink until you have washed. In case a pesticide is swallowed or gets in the eyes, follow the first aid treatment given on the label and get prompt medical attention. If a pesticide is spilled on your skin or clothing, remove clothing immediately and wash skin thoroughly.

Do not clean spray equipment or dump excess spray material near ponds, streams, or wells. Because it is difficult to remove all traces of herbicides from equipment, do not use the same equipment for insecti-

cides or fungicides that you use for herbicides.

Dispose of empty pesticide containers promptly. Have them buried at a sanitary land-fill dump, or crush and bury them in a level, isolated place.

**WARNING:** Recommendations for use of pesticides are reviewed regularly. The registrations on all suggested uses of pesticides in this publication were in effect at press time. Check with your county agricultural agent, State agricultural experiment station, or local forester to determine if these recommendations are still current.

## References

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